

WHAT IS CLAIMED IS:

1 1. A method of manufacturing an ink jet printing module comprising:
2 injection molding a precursor into a mold to form a stiffened piezoelectric
3 element; and
4 positioning the piezoelectric element over an ink chamber to subject ink
5 within the chamber to a jetting pressure upon applying a jetting voltage.

1 2. The method of claim 1, wherein the stiffened piezoelectric element has a curved
2 surface over the ink chamber.

1 3. The method of claim 2, wherein the curved surface is concave relative to the ink
2 chamber.

1 4. The method of claim 2, wherein the curved surface has a substantially constant
2 radius of curvature.

1 5. The method of claim 1, wherein the piezoelectric element includes lead zirconium
2 titanate.

1 6. The method of claim 1, wherein the jetting voltage is less than 60 volts.

1 7. The method of claim 2, wherein the curved surface has a radius of curvature of
2 less than 5 millimeters.

1 8. The method of claim 2, wherein the curved surface has a radius of curvature of
2 less than 3 millimeters.

1 9. The method of claim 1, further comprising placing a first electrode and a second
2 electrode on a surface of the piezoelectric element.

1 10. The method of claim 1, wherein the piezoelectric element has a thickness of less
2 than 50 microns.

1 11. The method of claim 1, further comprising orienting a wall of the chamber to
2 contact the stiffened piezoelectric element at an angle of greater than ninety degrees.

1 12. A method of depositing ink comprising:
2 delivering ink to an ink chamber; and
3 applying a jetting voltage across a first electrode and a second electrode on a
4 face of a stiffened piezoelectric element to subject ink within the chamber to a jetting
5 pressure, thereby depositing ink from an exit orifice of the ink chamber.

1 13. The method of claim 12, wherein the stiffened piezoelectric element has a curved
2 surface over the ink chamber.

1 14. The method of claim 13, wherein the curved surface is concave relative to the ink
2 chamber.

1 15. The method of claim 13, wherein the curved surface has a substantially constant
2 radius of curvature.

1 16. The method of claim 13, wherein the piezoelectric element includes lead
2 zirconium titanate.

1 17. The method of claim 13, wherein the jetting voltage is less than 60 volts.

1 18. The method of claim 14, wherein the curved surface has a radius of curvature of
2 less than 5 millimeters.

1 19. An ink jet printing module comprising:
2 an ink chamber;
3 a stiffened piezoelectric element having a region exposed to the ink chamber, the

piezoelectric element being positioned over the ink chamber to subject ink within the chamber to jetting pressure; and electrical contacts arranged on a surface of the piezoelectric element for activation of the piezoelectric element.

20. The ink jet printing module of claim 19, wherein the region of the stiffened piezoelectric element exposed to the ink chamber has a curved surface.

21. The ink jet printing module of claim 20, wherein the curved surface is concave relative to the ink chamber.

22. The ink jet printing module of claim 20, wherein the curved surface has a substantially constant radius of curvature.

23. The ink jet printing module of claim 19, wherein the piezoelectric element includes lead zirconium titanate.

24. The ink jet printing module of claim 19, wherein the piezoelectric element has a thickness of 5 to 300 microns.

25. The ink jet printing module of claim 19, wherein the piezoelectric element has a thickness of 10 to 250 microns.

26. The ink jet printing module of claim 19, wherein the piezoelectric element has a thickness of less than 100 microns.

27. The ink jet printing module of claim 19, wherein the chamber has a width of less than 1200 microns.

28. The ink jet printing module of claim 19, wherein the chamber has a width of 50 to 1000 microns.

1 29. The ink jet printing module of claim 19, wherein the chamber has a width of 100
2 to 800 microns.

1 30. The ink jet printing module of claim 20, wherein the curved surface has a radius
2 of curvature of 500 to 3000 microns.

1 31. The ink jet printing module of claim 20, wherein the curved surface has a radius
2 of curvature of 1000 to 2800 microns.

1 32. The ink jet printing module of claim 20, wherein the curved surface has a radius
2 of curvature of 1500 to 2600 microns.

1 33. The ink jet printing module of claim 19, wherein the electrodes are configured to
2 apply a voltage of less than 60 volts.

1 34. The ink jet printing module of claim 19, further comprising a series of chambers.

1 35. The ink jet printing module of claim 34, wherein each of the chambers is covered
2 by a single piezoelectric element.

1 36. The ink jet printing module of claim 19, wherein the chamber includes a wall
2 contacting the piezoelectric element exposed to the ink chamber at an angle of greater than
3 ninety degrees.